

CHROMOSOME NUMBERS IN GASTERIA, ASTROLOBA AND HYBRIDS

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Since lists of chromosome numbers have recently been published for *Aloë* (Riley, 1959c) and *Haworthia* (Riley, 1960a) based on both the writer's (Riley, 1958, 1959a) observations and those of others, it seems desirable to round out the tribe Aloineae by listing the results of studies that have been reported on *Gasteria*, *Astroloba* (*Apicra*), *Poellnitzia* and intergeneric hybrids. Some of these observations have been made by the author during recent years and will be combined with the results published by other investigators.

In Table 1 are listed the species of *Gasteria* that have been studied, the haploid or diploid numbers that have been recorded and the investigators who made the observations. Table 2 gives similar information for *Astroloba* (*Aprica*) and *Poellnitzia*. In Table 3 are given the results of studies on hybrids between *Gasteria* and *Haworthia* (= *Gasterhaworthia*), on those between *Gasteria* and *Astroloba*, and on *Gasteria-Aloë* hybrids (= *Gastrolea*). All the genera, including the hybrids, are arranged according to Jacobsen's (1954) *Handbuch der sukkulenten Pflanzen* which, although not entirely satisfactory, is the most recent treatment of the group.

In tabulating the number of diploid and polyploid plants, Jacobsen's (1954) *Handbuch* will be followed rigidly as this method is the only one that ensures uniformity. Therefore, for example, *G. disticha* (L.) Haw. will be counted only once even though it has also been published as *G. lingua* Bgr.; synonyms of other species will also be omitted from the tabulation.

In *Gasteria*, 44 identified species and four varieties of them were studied. Of the species, 43 were diploids and one had both diploid and tetraploid individuals whilst three of the varieties were diploid and one had $4n$ chromosomes. The only horticultural variety listed in Jacobsen was diploid. Nine interspecific hybrids were diploids, one was a triploid and one included both diploid and tetraploid plants. Eleven plants published as species and varieties which are not listed in Jacobsen were diploids, and of 132 unidentified plants, 127 were diploid, one was a

triploid and four were tetraploids. Included amongst the diploids were 50 plants from the Bushman's River Poort, Alexandria District, which resembled *G. zeyheri* very closely.

In *Astroloba*, four species were diploid ($n = 7$), one a triploid, one a tetraploid, one had nine chromosomes and one variety had 12. Two unidentified plants were diploid. In *Poellnitzia*, the only plant that was studied was a diploid. Most of the intergeneric hybrids were diploids including three plants of *Gasterhaworthia* and 10 of *Gastrolea*. In one study of a *Gasteria-Aloë* hybrid (Sato, 1937, 1942) both $2n$ and $4n$ individuals were found. One hybrid between *Gasteria* and *Astroloba* is listed as having "about 14" somatic chromosomes.

In *Gasteria*, 98 per cent of the named species were diploid as were 96 per cent of the named and unidentified plants taken together. This percentage is considerably higher than that found in *Haworthia* and about the same as that in *Aloë*; it indicates that apparently polyploidy has not been an important evolutionary factor in *Gasteria*. The observations on *Astroloba* and *Poellnitzia* are too few to be of significance.

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TABLE I

Species of *Gasteria* of which the chromosomes have been counted; the chromosome numbers reported; and the literature references. The species are arranged according to Jacobsen (1954).

Species.	n no.	2n no.	References.
Species listed in Jacobsen:			
<i>G. acinacifolia</i> (Jacq.) Haw. . . .	7	14	Riley, 1945, 1960b Sato, 1937, 1942; Riley, 1959b
<i>G. angustifolia</i> (Ait.) Haw. . . .	7		Geitler, 1935; Riley, 1960b
<i>G. angustifolia</i> var. <i>laevis</i> (Salm.) Haw. as <i>G. laevis</i> Haw.		14	Snoad, 1951a
<i>G. angustiarum</i> v. Poelln.		14	Riley, 1959b
<i>G. armstrongii</i> Schoenl.	7	14	Riley, 1945, 1960b Resende, 1937; Snoad, 1951a
as <i>G. armstrongii</i>		14	Sato, 1937, 1942
<i>G. beckeri</i> Schoenl.		14	Snoad, 1951a; Riley, 1959b
<i>G. brevifolia</i> Haw.	7	14	Marshak, 1934; Riley, 1945, 1960b Resende, 1937; Sato, 1937, 1942; Riley, 1959b
as <i>G. brachyphylla</i> (= <i>G. brachyphylla</i> ?)		14	Sato, 1937, 1942
<i>G. caespitosa</i> v. Poelln.		14	Riley, 1959b
<i>G. carinata</i> (Mill.) Haw.	7	14	Riley, 1960b Resende, 1937
as <i>G. carinata</i> Duval		14	Snoad, 1951a
as <i>G. carinata</i> (no author)	7	14	Marshak, 1934 Sato, 1937, 1942
<i>G. colubrina</i> N. E. Br.		14	Snoad, 1951a
<i>G. conspurcata</i> (Salm.) Haw. . . .	7		Riley, 1960b
as <i>G. lingua</i> var. <i>conspurcata</i> . . .	7		Ferguson, 1926
<i>G. croucheri</i> (Hook. f.) Bak. . . .		14	Snoad, 1951a
<i>G. decipiens</i> Haw.		14	Riley, 1959b

Species.	n no.	2n no.	References.
Species listed in Jacobsen—Continued			
<i>G. dicta</i> N. E. Br.	7		Riley, 1960b
<i>G. disticha</i> (L.) Haw.	7		Marshak, 1934
as <i>G. lingua</i> Bgr.	7		Ferguson, 1926; Marshak, 1934
		14	Resende, 1937
<i>G. elongata</i> Bak.	7		Marshak, 1934.
<i>G. ernesti-ruschii</i> Dtr.		14	Riley, 1959b
<i>G. fasciata</i> (Salm.) Haw.	7		Kondo and Megata, 1943; Riley, 1960b
		14	Kondo and Megata, 1943
<i>G. fuscopunctata</i> Bak.	7		Riley, 1960b
as <i>G. excelsa</i>	7		Ferguson, 1926
<i>G. glabra</i> Haw.	7		Riley, 1960b
		14	Resende, 1937; Riley, 1959b
<i>G. gracilis</i> Bak.			
as <i>G. gracilis</i> v. Poelln. (?)		14	Kondo and Megata, 1943
<i>G. humilis</i> v. Poelln.		14	Riley, 1959b
<i>G. laetipunctata</i> Haw.	7		Riley, 1960b
as <i>G. laetipunctata</i>	7		Riley, 1945
		14	Resende, 1937
<i>G. liliputana</i> v. Poelln.		14	Snoad, 1951a; Riley, 1959b
<i>G. maculata</i> (Thunbg.) Haw.		14	Resende, 1937
	7		Riley, 1960b
as <i>G. nigricans platyphylla</i>	7	28	Sato, 1937, 1942
<i>G. mollis</i> Haw.	7		Ferguson, 1926
			Marshak, 1934; Riley, 1960b
<i>G. neliana</i> v. Poelln.		14	Resende, 1937; Riley, 1959b
<i>G. nigricans</i> Haw.	7		Marshak, 1934; Riley, 1945, 1960b
		14	Resende, 1937; Sato, 1937, 1942; Riley, 1959b
		28	Ferguson, 1926; Kondo and Megata, 1943,
<i>G. nigricans</i> var. <i>crassifolia</i> (Ait.) Haw.		28?	Ferguson, 1926
<i>G. nitida</i> (Salm.) Haw.	7		Riley, 1945, 1960b
		14	Resende, 1937
<i>G. obtusa</i> (Salm.) Haw.		14	Resende, 1937
<i>G. obtusifolia</i> (Salm.) Haw.	7		Riley, 1945, 1960b
		14	Resende, 1937
<i>G. parviflora</i> Bak.	7		Riley, 1945, 1960b
<i>G. planifolia</i> Bak.	7		Marshak, 1934; Riley, 1945, 1960b
		14	Resende, 1937; Sato, 1937, 1942
<i>G. poellnitziana</i> Jacobsen		14	Riley, 1959b
<i>G. prolifera</i> Lem.	7		Jähnl, 1947; Geitler, 1935
<i>G. pseudonigricans</i> (Salm.) Haw.	7		Riley, 1960b
<i>G. pulchra</i> (Ait.) Haw.	7		Marshak, 1934
		14	Resende, 1937; Kondo and Megata, 1943; Snoad, 1951a; Riley, 1959b
<i>G. retata</i> Haw.	7		Ferguson, 1926
		14	Riley, 1959b

Species.	n no.	2n no.	References.
Species listed in Jacobsen—Continued			
<i>G. schweickerdiana</i> v. Poelln.		14	Riley, 1959b
<i>G. subcarinata</i> (Salm.) Haw.	7		Marshak, 1934
<i>G. subverrucosa</i> (Salm.) Haw.		14	Riley, 1959b
<i>G. sulcata</i> (Salm.) Haw.	7		Marshak, 1934; Riley, 1945, 1960b
<i>G. trigona</i> Haw.	7		Riley, 1960b
<i>G. verrucosa</i> (Mill.) Duv.	7		Resende, 1937
		14	Marshak, 1934; Riley, 1960b
as <i>G. verrucosa</i> Haw.		14	Riley, 1959b; Taylor, 1924
			Resende, 1937; Kondo and Megata, 1943
<i>G. verrucosa</i> var. <i>asperrima</i> (Salm.) v. Poelln.	7		Riley, 1960b
<i>G. verrucosa</i> var. <i>latifolia</i> Haw.		14	Sato, 1937, 1942
<i>G. zeyheri</i> (Salm.) Bak.	7		Jähnl, 1947; Riley, 1960b
Horticultural varieties:			
<i>G. croucheri</i> var. <i>spathulata</i> HORT. KEW	7		Ferguson, 1926
Putative intrageneric, interspecific hybrids:			
<i>G. brevifolia</i> × <i>G. nigricans</i>	7		Riley, 1945, 1960b
<i>G. brevifolia</i> × <i>G. nigricans</i>	7		Riley, 1945, 1960b
<i>G. brevifolia</i> × <i>G. planifolia</i>	7		Riley, 1945, 1960b
<i>G. cheilophylla</i> × Bak. (= <i>G. verrucosa</i> × <i>G. pulchra</i>)	7		Ferguson, 1926; Riley, 1960b; Geitler, 1935
as <i>G. cheylophylla</i> Bak.		14, 28	Sato, 1937, 1942
<i>G. margaritifera</i> × Bgr.	7	14	Resende, 1937
		14	Riley, 1960b
<i>G. planifolia</i> × <i>G. nigricans</i>	7		Sato, 1942
<i>G. planifolia</i> × <i>G. sulcata</i>	7		Riley, 1945, 1960b
<i>G. pulchra</i> × <i>G. planifolia</i>	7		Riley, 1960b
<i>G. sulcata</i> × <i>G. nigricans</i>	7		Riley, 1945, 1960b
<i>G. sulcata</i> × <i>G. planifolia</i>	7	21	Riley, 1948a
<i>G. verrucosa</i> × <i>G. brevifolia</i>	7		Riley, 1960b
<i>G. verrucosa</i> × <i>G. pulchra</i>	7		Riley, 1945, 1960b
Species and varieties not listed in Jacobsen (1954):			
<i>G. cooperi</i>	7		Ferguson, 1926
<i>G. depressa</i>	7		Geitler, 1935
<i>G. disticha</i> var. <i>comprucata</i> (= <i>G. conspurcata</i> ?)		14	Sato, 1937, 1942
<i>G. gracilia</i> var. <i>minima</i>		14	Sato, 1942
<i>G. lingua</i> var. <i>conspurcata</i>	7		Ferguson, 1926
<i>G. minima</i> v. Poelln.		14	Kondo and Megata, 1943
<i>G. multipunctata</i>		14	Sato, 1937, 1942
<i>G. nigricans</i> var. <i>fasciata</i>	7		Riley, 1945
<i>G. obscura</i>		14	Sato, 1937, 1942
<i>G. rotata</i>	7		Ferguson, 1926
<i>G. rurex</i> Hort.		14	Snoad, 1951a
<i>G. vittata</i>		14	Resende, 1937; Sato, 1937, 1942
Unidentified plants:			
<i>G. "aruhero"</i>		14	Sato, 1937, 1942

Species.	<i>n</i> no.	<i>2n</i> no.	References.
<i>G.</i> sp. "Gyu-zetu"		14	Kondo and Megata, 1943
<i>G.</i> sp. HORT.		14	Snoad, 1951a
<i>G.</i> sp. (resembling <i>G. zeyheri</i>) (50 plants)		14	Riley, 1959b
<i>G.</i> sp. (48 plants)		14	Riley, 1959b
<i>G.</i> sp. (2 plants)		14	Resende, 1937
<i>G.</i> sp. (1 plant)	7	14	Taylor, 1931
<i>G.</i> sp. (23 plants)		14	Snoad, 1951b
<i>G.</i> sp. (1 plant)		21	Snoad, 1951b
<i>G.</i> sp. (1 plant)		28	Resende, 1937
<i>G.</i> sp. (3 plants)		28	Snoad, 1951b

TABLE 2.

Species of *Astroloba* (Apicra) and *Poellnitzia* of which the chromosomes have been counted; the chromosome numbers reported; and the literature references. The species are arranged according to Jacobsen (1954).

Species.	<i>n</i> no.	<i>2n</i> no.	References.
<i>Astroloba</i> (<i>Apicra</i>)			
<i>A. aspera</i> (Willd.) Uitew.	7		Ferguson, 1926
as <i>Haworthia aspera</i>		14	Snoad, 1951a
<i>A. bicarinata</i> (Haw.) Uitew. ..		21	Resende, 1937
<i>A. congesta</i> (Salm.) Uitew. ..	9		Marshak, 1934
<i>A. deltoidea</i> (Hook. f.) Uitew. ..	7	14	Ferguson, 1926
		14	Resende, 1937
		14	Resende, 1937
<i>A. foliosa</i> (Willd.) Uitew.			
<i>A. pentagona</i> (Haw.) Uitew. ..			
as <i>A. pentagona</i> Willd.		28	Resende, 1937
as <i>Haworthia spiralis</i> Haw. ..		14	Sato, 1937, 1942
<i>A. pentagona</i> var. <i>spiralis</i> (Haw.) Uitew.	12		Ferguson, 1926
<i>A. spiralis</i> (L.) Uitew.			
as <i>A. spiralis</i> (L.) Bak.		14	Resende, 1937; Kondo and Megata, 1943
<i>A.</i> sp.	7		Geitler, 1935; Suto, 1936
<i>A.</i> sp.		14	Riley, 1959b
<i>Poellnitzia</i>			
<i>P. rubriflora</i> (L. Bol.) Uitew. ..			
as <i>Apicra rubriflora</i> L. Bol. ..		14	Resende, 1937

TABLE 3.

Chromosome numbers of intergeneric hybrids in the Aloineae; the hybrids are listed according to Jacobsen (1954).

Hybrid.	<i>n</i> no.	<i>2n</i> no.	References.
<i>Gasterhaworthia</i> × <i>Guill.</i>			
<i>G.</i> × <i>bayfieldii</i> (S. D.) Rowley ..		14	Rowley, 1954
as <i>Gasteria bayfieldii</i> Bak. ..		14	Snoad, 1951a
<i>G.</i> × <i>holtzei</i> (Radl.) Guill. ..			
as <i>Gasteria Holtzei</i>	7		Ferguson, 1926
<i>G.</i> × sp. (<i>Haworthia</i> sp. × <i>Gasteria</i> sp. (?))		14	Kondo and Megata, 1943
<i>Gasteria</i> × <i>Astroloba</i>			
<i>Gasteria</i> × <i>apicroides</i> Bak.		ca. 14	Ferguson, 1926

Hybrid.	<i>n</i> no.	<i>2n</i> no.	References.
<i>Gastrolea</i> × <i>E.</i> Walth. (= <i>Gasteria</i> × <i>Aloë</i>)			
<i>G.</i> × <i>bedinghausii</i> (Radl.) E. Walth.			
as <i>Aloë aristata</i> × <i>Bedinghausii</i> Radl.		14	Resende, 1937
<i>G.</i> × <i>beguinii</i> (Radl.) E. Walth.			
as <i>Aloë aristata</i> × <i>Beguinii</i> Hort.		14	Resende, 1937
<i>G.</i> × <i>lapaizii</i> (Radl.) Jacobs.			
as <i>Aloë aristata</i> × <i>Lapaizii</i> Radl.		14	Resende, 1937
<i>Gasteria</i> "gyuzetu" × <i>Aloë variegata</i>		14	Sinoto and Sato, 1940
		14, 28	Sato, 1937, 1942
<i>Gasteria</i> sp. × <i>Aloë</i> sp.	7		Riley, 1947, 1948b, 1950
<i>Aloë variegata</i> × <i>Gasteria</i> "gyuzetu"		14	Sinoto and Sato, 1940; Sato, 1942
<i>Aloë variegata</i> × <i>Gasteria</i> sp. "Seiryuto" (?)	7	14	Kondo and Megata, 1943
<i>Aloë variegata</i> × <i>Gasteria verrucosa</i> . .	7	14	Kondo and Megata, 1943
<i>Aloë variegata</i> × <i>Gasteria verrucosa</i> var. <i>latifolia</i>		14	Sato, 1937, 1942; Sinoto and Sato, 1940
<i>Gasteria verrucosa</i> × <i>Aloë variegata</i> . .	7	14	Kondo and Megata, 1943